SUPPLEMENTAL MATERIAL

Prolonged, uninterrupted sedentary behavior and glycemic biomarkers among US Hispanic/Latino adults: The Hispanic Community Health Study/Study of Latinos (HCHS/SOL)

Keith M. Diaz[1], PhD; Jeff Goldsmith[2], PhD; Heather Greenlee[3], ND PhD; Garrett Strizich[4], MPH; Qibin Qi[4], PhD; Yasmin Mossavar-Rahmani[4], PhD; Denise C. Vidot[5], PhD; Christina Buelna[6], MA; Carrie E. Brintz[5], PhD; Tali Elfassy[7], PhD; Linda C. Gallo[8], PhD; Martha L. Daviglus[9], MD PhD; Daniela Sotres-Alvarez[10], DrPH; Robert Kaplan[4] , PhD

[1]Center for Behavioral Cardiovascular Health, Department of Medicine, Columbia University Medical Center, New York, NY; [2]Department of Biostatistics, Mailman School of Public Health, Columbia University, New York, NY; [3]Department of Epidemiology, Mailman School of Public Health, Columbia University, New York, NY; [4]Department of Epidemiology and Population Health, Albert Einstein College of Medicine, Bronx, NY; [5]Department of Psychology, University of Miami , Coral Gables, Florida; [6]South Bay Latino Research Center, Graduate School of Public Health, San Diego State University, San Diego, CA; [7]Department of Epidemiology & Public Health, University of Miami, Miami, Florida; [8]Department of Psychology, San Diego State University, San Diego, CA; [9]Institute for Minority Health Research, University of Illinois at Chicago, Chicago, IL; [10]Collaborative Studies Coordinating Center, Department of Biostatistics, Gillings School of Global Public Health, University of North Carolina at Chapel Hill, Chapel Hill, North Carolina.

Correspondence:
Keith M. Diaz
Columbia University Medical Center
622 West 168th Street, PH9-319
New York, NY 10032
212-304-5231
Fax: 212-305-3172
Email: kd2442@columbia.edu

SUPPLEMENTAL METHODS

Data Collected at Baseline: A comprehensive battery of interview-administered questionnaires was used to collect information relating to personal and family characteristics and health status and behaviors during the baseline exam of the Hispanic Community Health Study/Study of Latinos (HCHS/SOL). For the present analyses, demographic factors (age, sex, Hispanic background, education level, annual household income, employment status, nativity), cardiovascular risk factors (current smoking, alcohol use, healthy eating index), and medical status-related factors (physical health, mental health, antidiabetic medication usage, comorbid conditions) were included as covariates. Participants self-identified into the following Hispanic backgrounds: Central American, Cuban, Dominican, Mexican, Puerto Rican, South American, or Other. Education was measured as the highest level of schooling completed and classified into 3 categories for the present analyses: less than high school diploma/GED, high school diploma/GED only, or greater than a high school diploma/GED. Annual household income was self-reported into 10 categories ranging from <$10,000 to >100,000. For the present analyses, responses were classified into 2 categories: <$30,000 or ≥$30,000. Self-reported employment status was classified as employed full-time (≥35 hours), employed part-time (<35 hours), retired, or unemployed. Nativity was defined as being born in 50 U.S. states or Washington DC versus being born outside the mainland U.S., including Puerto Rico.

Two questions were used to ascertain smoking status: "Have you ever smoked at least 100 cigarettes in your entire life?" and "Do you now smoke daily, some days, or not at all?" If participants had smoked at least 100 cigarettes in their entire life and reported smoking daily or some days, then they were considered current smokers. Participants' self-reported their quantity and frequency of alcohol consumption in the past year, and were grouped as non-drinkers (no alcohol), moderate drinkers (≤ 7 and ≤ 14 drinks per week for women and men, respectively), or heavy drinkers (>7 or >14 drinks per week for women and men, respectively). The alternative healthy eating index-2010 (AHEI-2010)[1] was calculated based on two 24-hour dietary recalls (one at the baseline exam and the other 6 weeks later via telephone) using the National Cancer Institute methodology.[2]

Subjective health status was assessed using the Medical Outcomes Study Short-Form Health Survey (SF-12).[3] Physical and mental component summary scores were calculated and included as covariates. Antidiabetic medication usage was defined using a medication review. Participants were instructed to bring all prescription and nonprescription medication taken in the past four weeks to the baseline clinic exam visit. Their preparations, concentrations, and units were coded for analysis. Healthcare access was assessed by health insurance status (yes/no) and number of self-reported doctor visits in the past 12 months.

As a sensitivity analysis to account for potential additional confounders of the association between sedentary bout length and the glycemic biomarkers, regression models were also adjusted for hypertension, estimated glomerular filtration rate, non-alcoholic fatty liver disease, heart rate, and C-reactive protein. Blood pressure was determined as the mean of three measurements taken after 5 minutes of seated rest, and hypertension was defined as systolic blood pressure of 140 mmHg or greater, diastolic blood pressure of 90 mmHg or greater, or self-reported use of antihypertensive medication in the previous 4 weeks. Estimated glomerular filtration rate was calculated using the Chronic Kidney Disease Epidemiology Collaboration (CKD-EPI) equation.[4] Non-alcoholic fatty liver disease was defined as either aspartate aminotransferase >37 IU/mL or alanine aminotransferase (ALT) >40 IU/mL for men and aspartate aminotransferase or ALT >31 IU/mL for women.[5] Heart rate was determined by a resting, standard, 12-lead, 10-second electrocardiogram following a standardized protocol. High-sensitivity C-reactive protein was measured using an immunoturbidimetric method (Roche Diagnostics).

SUPPLEMENTAL REFERENCES

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Supplemental Table 1. Glycemic biomarkers by mean sedentary bout duration quartiles with adjustment for additional covariates (hypertension, estimated glomerular filtration rate, non-alcoholic fatty liver disease, heart rate, and C-reactive protein).

Variable	Quartile 1 *(n=3020)*	Quartile 2 *(n=3021)*	Quartile 3 *(n=3021)*	Quartile 4 *(n=3021)*	P-Trend
HOMA-IR*					
Unadjusted	2.32 (2.21, 2.44)	2.44 (2.34, 2.54)	2.50 (2.39, 2.61)	2.84 (2.69, 2.99)	<0.001
Model 1	2.69 (2.50, 2.89)	2.78 (2.59, 2.99)	2.86 (2.66, 3.07)	3.06 (2.85, 3.29)	<0.001
Model 2	2.74 (2.55, 2.95)	2.80 (2.61, 3.01)	2.85 (2.66, 3.05)	3.00 (2.80, 3.21)	0.007
2-hour glucose (mg/dl)					
Unadjusted	113.7 (111.6, 115.8)	118.5 (116.3, 120.8)	117.2 (115.0, 119.4)	119.9 (117.3, 122.5)	0.001
Model 1	132.8 (117.3, 148.3)	136.5 (121.0, 152.1)	135.7 (120.4, 151.1)	137.3 (122.0, 152.6)	0.009
Model 2	133.1 (117.7, 148.4)	136.5 (121.1, 151.9)	135.4 (120.2, 150.7)	136.5 (121.2, 151.7)	0.070
Hb1Ac (mmol/mol)					
Unadjusted	38.47 (37.84, 39.09)	39.24 (38.47, 40.02)	38.35 (37.77, 38.93)	40.52 (39.78, 41.26)	<0.001
Model 1	49.35 (48.13, 50.56)	49.36 (48.00, 50.73)	48.56 (47.38, 49.74)	48.97 (47.76, 50.18)	0.216
Model 2	49.39 (48.19, 50.60)	49.38 (48.02, 50.75)	48.55 (47.36, 49.73)	48.92 (47.70, 50.14)	0.128

Data presented as predicted marginal mean (95% CI) or percent (95% CI); all analyses account for the complex sampling scheme of HCHS/SOL.
Hb1Ac, glycosylated hemoglobin; HOMA-IR, Homeostasis model assessment of insulin resistance.
*Log transformed for statistical testing; untransformed means are presented for ease of interpretation.
Model 1 adjusted for age, sex, study center, Hispanic background, education level, annual household income, employment status, birthplace outside of U.S., smoking, alcohol drinking, AHEI-2010 score, SF-12 physical, SF-12 mental, antidiabetic medication, health insurance, healthcare utilization, hypertension, estimated glomerular filtration rate, non-alcoholic fatty liver disease, heart rate, and C-reactive protein.
Model 2 adjusted for covariates in model 1 plus moderate-vigorous physical activity.
Quartile cutpoints were 6.72, 8.57, and 11.02 min/bout.

Supplemental Table 2. Joint associations of total sedentary time and prolonged, uninterrupted sedentary bouts with glycemic biomarkers defining high/low threshold from 50th to 85th percentile

Variable	Low Total SED/Low SED Bout	Low Total SED/High SED Bout	High Total SED/Low SED Bout	High Total SED/High SED Bout	P1	P2	P3
HOMA-IR*							
50th percentile	2.90 (2.70, 3.13)	3.02 (2.73, 3.33)	2.90 (2.65, 3.17)	3.11 (2.90, 3.34)	0.324	0.989	0.009
55th percentile	2.91 (2.70, 3.13)	3.03 (2.75, 3.33)	2.91 (2.63, 3.23)	3.13 (2.91, 3.35)	0.298	0.963	0.007
60th percentile	2.93 (2.72, 3.15)	2.94 (2.69, 3.22)	2.86 (2.58, 3.17)	3.15 (2.93, 3.39)	0.863	0.610	0.006
65th percentile	2.91 (2.71, 3.12)	2.90 (2.64, 3.18)	2.96 (2.69, 3.26)	3.19 (2.96, 3.44)	0.922	0.692	0.001
70th percentile	2.91 (2.71, 3.12)	2.97 (2.71, 3.25)	2.98 (2.69, 3.29)	3.23 (2.99, 3.48)	0.578	0.574	<0.001
75th percentile	2.91 (2.71, 3.13)	2.91 (2.64, 3.21)	2.96 (2.69, 3.27)	3.30 (3.05, 3.58)	0.999	0.672	<0.001
80th percentile	2.91 (2.71, 3.12)	3.03 (2.73, 3.36)	3.26 (2.93, 3.62)	3.31 (3.04, 3.61)	0.389	0.014	<0.001
85th percentile	2.93 (2.74, 3.14)	3.19 (2.84, 3.59)	3.07 (2.65, 3.56)	3.38 (3.08, 3.70)	0.144	0.511	<0.001
2-hour glucose (mg/dl)							
50th percentile	133.4 (117.6, 149.1)	133.1 (117.0, 149.2)	137.7 (121.3, 154.2)	136.1 (120.5, 151.7)	0.895	0.089	0.018
55th percentile	133.6 (117.7, 149.6)	132.2 (115.8, 148.5)	137.5 (121.0, 154.1)	137.0 (121.1, 152.8)	0.432	0.103	0.005
60th percentile	134.6 (118.7, 150.6)	131.4 (115.1, 147.8)	138.2 (121.6, 154.8)	137.3 (121.5, 153.2)	0.110	0.129	0.028
65th percentile	134.1 (118.3, 149.9)	131.4 (115.3, 147.6)	136.3 (119.8, 152.9)	137.5 (121.8, 153.2)	0.204	0.405	0.007
70th percentile	134.6 (118.8, 150.3)	130.2 (114.3, 146.0)	136.8 (120.9, 152.8)	138.6 (122.9, 154.3)	0.021	0.377	0.003
75th percentile	134.2 (118.3, 150.1)	130.6 (114.4, 146.9)	137.5 (121.4, 153.6)	138.9 (123.0, 154.8)	0.104	0.209	0.002
80th percentile	134.1 (118.3, 149.9)	131.9 (115.9, 147.9)	143.3 (126.7, 160.0)	140.6 (124.7, 156.5)	0.294	0.002	<0.001
85th percentile	134.6 (118.8, 150.4)	135.3 (118.4, 152.2)	139.1 (122.9, 155.2)	140.2 (124.1, 156.3)	0.821	0.121	0.001

Data presented as predicted marginal mean (95% CI) or percent (95% CI); all analyses account for the complex sampling scheme of HCHS/SOL.
Hb1Ac, glycosylated hemoglobin; HOMA-IR, Homeostasis model assessment of insulin resistance; SED, sedentary.
*Log transformed for statistical testing; untransformed means are presented for ease of interpretation.
P1=P-value for Low Total SED/Low SED bout vs. Low Total SED/High SED Bout; P2=P-value for Low Total SED/Low SED Bout vs. High Total SED/Low SED bout; P3=P-value for Low Total SED/Low SED Bout vs. High Total SED/High SED Bout.
Models adjusted for age, sex, study center, Hispanic background, education level, annual household income, employment status, birthplace outside of U.S., smoking, alcohol drinking, AHEI-2010 score, SF-12 physical, SF-12 mental, antidiabetic medication, health insurance, healthcare utilization, and moderate-vigorous physical activity.